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EXAMINER

UHLIR, NIKOLAS J

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 11/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

016

Office Action Summary

Application No.

09/981,766

Applicant(s)

TAKAO ET AL.

Examiner

Nikolas J. Uhler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 6, 8 and 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 10-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other:

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DETAILED ACTION

1. This office action is in response to the arguments/request for continued examination filed 8/08/03. Applicant's amendment to the claims is sufficient to warrant removal of the prior 35 U.S.C 112 first paragraph rejection. Accordingly, this rejection is hereby withdrawn. Currently, claims 1-20 are pending, with claims 6 and 7-10 withdrawn from consideration.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the instant case, claim 1 requires a ratio of long axis to short axis diameter of "more or less 1:1." The term "more or less" in claim 1 is a relative term which renders the claim indefinite. The term "more or less" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The primary issue with the term "more or less" is that different people interpret the scope of "more or less" 1:1 differently. Some might interpret "more or less" 1:1 to mean within 5% of 1:1, while other may interpret the phrase much more broadly. Clarification is required.

Claim Rejections - 35 USC § 102

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4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 5, 7 and 10, 13 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Weimer et al. (US5126121) as evidenced by Pratsinis et al. (US5525320).

6. The limitations "flame synthesized," and "manufactured in a vapor phase in the presence of a flame, by using a raw material powder consisting of element Al, or a mixture of a powder consisting of elements Al and O and a powder consisting of element C" in claim 1, the entirety of claim 2, "prepared by subjecting the powder to heat treatment either continuously or intermittently in a temperature... to the powder" in claim 5, and the entirety of claims 10-19 are product by process limitations that do not appear to patentably distinguish the claimed invention from the prior art structure, regardless of how the prior art structure is manufactured. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP § 2113.

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7. Claim 1 requires a flame synthesized aluminum nitride filler powder comprising elements Al, O, or N, or Al and N, wherein the particle size of the powder is 0.001-500 μ m, the mean particle size is between 0.1-100 μ m, whereby the external shape of the particles is spherical with a ratio of long axis diameter to short axis diameter of more or less 1:1, and the powder is manufactured continuously, not through batch type production by using as a raw material powder consisting of element Al, or a mixture of a powder consisting of the elements Al and O and a powder consisting of element C.

8. Regarding these limitations, Weimer et al. teaches aluminum nitride powder which is produced by a process comprising the steps of passing aluminum powder and a nitrogen source through a heated reaction zone, to form aluminum nitride particles (column 3, lines 8-33). Weimer et al. teaches a specific embodiment in which particles of AlN having a diameter of 0.4-0.8 μ are formed utilizing this process (column 11, lines 40-46). Thus, the powder of Weimer et al. meets the particle size requirements of claim 1.

9. Regarding the requirement that the particles be "spherical" and have a specific long axis diameter/short axis diameter ratio. Although Weimer et al. does not specifically teach that the produced Aluminum Nitride particles are spherical, the examiner takes the position that this limitation is necessarily met. It is well known in the art that in the production of aluminum nitride particles via floating nitridation, wherein aluminum particles are entrained in nitrogen gas and passed through a heated reactor (see Weimer et al. column 2, lines 35-50), the temperature of the reaction zone has an impact on the morphology of the produced particles. Specifically, it is well known that

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spherical particles form at temperatures $\geq 1373\text{K}$, whereas a mixture of rod shaped and spherical particles form at lower temperatures (as evidenced by Pratsinis et al. column 3, lines 18-36). The process utilized by Weimer et al. entrains aluminum particles in nitrogen gas and passes them through a heated reaction zone, and thus is a floating nitridation process (column 9, lines 9-30). Further, in a specific example the Weimer et al. process utilizes a reaction zone temperature $\sim 1600^{\circ}\text{C}$ (1873 K), which well exceeds the 1373K mark that is known to produce spherical particles. Thus, as the process of Weimer will necessarily produce spherical particles (as evidenced by Pratsinis), the particles of Weimer meet applicants claimed particle shape and long axis diameter/short axis diameter ratio.

10. The limitations of claim 2 are entirely product by process limitations, which have not yet been established to patentably distinguish the claimed product from that of the prior art. Applicant is referred to the paragraph-addressing product by process limitations at the beginning of this section for more information.

11. Regarding the limitations of claim 3, wherein the applicant requires that the Aluminum Nitride powder be produced from a raw material consisting of the element Al, whose particle size is within the range of $0.01\text{-}500\mu$, and the nitridation reaction is proceeded by using a flame in the presence of nitrogen, ammonia, or an inert gas. Although these limitations are purely product by process addressed above, it should be noted that Weimer et al. does teach a process for forming spherical aluminum nitride particle having the require particle size from a raw material of 99.95% pure aluminum (column 5, lines 39-450). The examiner takes the position that 99.95% pure Al meets the

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requirement that the raw material "consist of element Al" as small levels of irremovable impurities will inherently be present in any raw material powder. Further, the Weimer et al. process utilizes either nitrogen or ammonia as the nitrogen source (column 8, lines 15-20). Thus, the limitations of claim 3 are met.

12. Regarding the limitations of claim 5, wherein applicant requires the powder of claim 1 to be heat treated either continuously or intermittently in a temperature range from 500-10,000⁰ C in the presence of air, nitrogen, ammonia, an inert gas, or vacuum, by using a flame or an apparatus capable of applying a high temperature to the powder. Although these limitations are purely product by process limitations as addressed above, it is noted that Weimer et al. teaches that the aluminum nitride powder is beneficially milled and subjected to a secondary reaction to increase the conversion of aluminum to aluminum nitride. This secondary reaction comprises subjecting the aluminum nitride powder to a heat treatment in a temperature range between 1123-1873K (850-1600⁰ C) (columns 8-9, lines 60-20). Thus the limitations of claim 5 are met.

13. Regarding the limitations of claim 7, wherein the applicant requires the powder according to claim 1, wherein the powder is used as a raw material in a composite material system in which the powder is filled in a resin type raw material comprising organic materials. Weimer et al. teaches the incorporation of the AlN particles into an organic binder (column 12, lines 34-38). Thus, the limitations of claim 7 are met.

14. Regarding the limitations of claims 10, 13, wherein the applicant requires the powders recited in claims 2 and 3 respectively to be heat treated in a temperature range

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of 500-10,000°C (claims 10, 13, 15). These limitations are met as set forth above for claim 5 above.

15. Regarding the limitations of claim 20, wherein the applicant requires an aluminum nitride filler-powder "consisting of" elements Al, O, or N, or "consisting of" elements Al and N, wherein the particle size of the powder is from 0.001-500µm, the mean particle size thereof is from 0.1-100µm, and the external shape of the particles is spherical. These limitations are met as set forth above for claim 1.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claims 12-15, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weimer et al. evidenced by Pratsinis et al. as applied to claim 1 above, and further in view of Parent et al.

18. Weimer et al. as evidenced by Pratsinis et al. does not teach incorporating the AlN particles of claims 2-3, 5 and 10 into a resin binder, as requires by claims 12-15 and 19.

19. However, Parent et al. teaches that AlN particles are useful for reinforcing many types of matrices, including polymer matrices (column 7, lines 48-58). It is the examiners position that a polymer material is equivalent to applicant's claimed "resin type" material comprising organic materials.

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20. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the heat treated powder taught by Weimer et al. into a polymer material, as taught by Parent et al.

21. One would have been motivated to make this modification due to the teaching in Parent et al. that AlN powders are useful for reinforcing polymer matrices.

22. Claims 1, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weimer et al. (US5219804) in view of Weimer et al. (US5126121), as evidenced by Pratsinis et al.

23. For the purpose of clarity, the Weimer et al. references will be referred to as Weimer 804 and Weimer 121.

24. It should be noted that the comments regarding product by process limitations as stated above also apply to this portion of the rejection

25. Regarding the limitations of claims 1 and 4, wherein the applicant requires spherical Aluminum Nitride filler powder comprising the elements Al, O, and N, or Al and N that has a particle size between 0.001-500 μ , and a mean particle size between 0.1-100 μ (claim 1), wherein the AlN filler powder is formed from a raw material powder that is a mixture of a powder consisting of the elements Al and O and a powder consisting of the element C, wherein the raw material powder has a particle size between 0.001-500 μ (claim 4).

26. Regarding these limitations, Weimer 804 teaches a specific example in which Aluminum Nitride Powder is formed from a mixture of alumina powder and carbon black in a floating nitridation apparatus at 2173K (column 9, lines 5-67). The aluminum oxide

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(alumina) typically has a particle size in the range of 0.05-20 μ m (column 4, lines 40-47).

Although Weimer et al. does not teach that the product powder is spherical as required by claim 1, the examiner takes the position that this limitation is met, as it is well known in the art that spherical AlN forms at temperatures >1373K in floating nitridation processes, as evidenced by Pratsinis et al. (Pratsinis et al. column 3, lines 18-36).

27. Weimer 804 as evidenced by Pratsinis et al. does not teach the particle size of the carbon raw material, as required by claim 4.

28. However, Weimer 121 teaches a floating nitridation process to form aluminum nitride from an aluminum powder and a carbon powder. Suitable carbon powders for this process typically have a particle size in the range of 0.01-1.0 μ (column 6, lines 1-10).

29. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize 0.1-1.0 μ carbon powder as taught by Weimer 121 in the process of Weimer 804.

30. One would have been motivated to make this modification due to the fact that both references are concerned with forming Aluminum Nitride via floating nitridation utilizing aluminum based powder and carbon powder as precursors, and the fact that Weimer 121 teaches that 0.1-1.0 μ carbon powder is suitable for this purpose.

31. Regarding the limitations of claim 16, wherein the applicant requires the powder of claim 4 to be heat treated in a temperature range between 500-10,000⁰ C in the presence of air, nitrogen, ammonia, an inert gas, or vacuum by using a flame or an apparatus capable of applying a high temperature to the powder.

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32. Although the limitations of claim 16 are purely product by process, it is noted that Weimer 804 teaches post treating the aluminum nitride powder formed from alumina and carbon at a temperature of 2573⁰ C. Thus, these limitations are met.

33. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weimer 804 in view of Weimer 121, as evidenced by Pratsinis et al. as applied to claim 1 above, and further in view of Parent et al.

34. Weimer 804 as in view of Weimer 121, as evidenced by Pratsinis et al. does not teach incorporating the AlN particles of claims 2-3, 5 and 10 into a resin binder, as requires by claims 17 and 18.

35. However, Parent et al. teaches that AlN particles are useful for reinforcing many types of matrices, including polymer matrices (column 7, lines 48-58). It is the examiners position that a polymer material is equivalent to applicants claimed "resin type" material comprising organic materials.

36. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the heat treated powder taught by Weimer 804 in view of Weimer 121 as evidenced by Pratsinis et al. into a polymer material, as taught by Parent et al.

37. One would have been motivated to make this modification due to the teaching in Parent et al. that AlN powders are useful for reinforcing polymer matrices.

Response to Arguments

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38. Applicant's arguments filed 8/08/03 have been fully considered but they are not persuasive. In the instant case, the applicant presented the following arguments (summarized):

- A prima facie case of anticipation cannot be made over Weimer '121 because the reference does not disclose that the particles are spherical. The examiner appears to rely on the teachings of Pratsinis to establish that the particles formed by the process of Weimer '121 are spherical because they are formed above 1373K. This is a prima facie case of obviousness, not anticipation. Further, even assuming that spherical particles form some of the time, the examiner has not provided an adequate showing that establishes that particles formed by the process of Weimer are spherical each and every time. Further, the examples of Weimer '121 have been shown to form "light agglomerates."

39. This argument is not persuasive. Applicant is respectfully directed to MPEP 2131.01, which states: "Normally, only one reference should be used in making a rejection under 35 U.S.C. 102. However, a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to: (A) Prove the primary reference contains an "enabled disclosure; "(B) Explain the meaning of a term used in the primary reference; or **(C) Show that a characteristic not disclosed in the reference is inherent.**" In regards to option C, MPEP 2131.01 states: "To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill."

40. In the instant case, the examiner merely utilized the Pratsinis reference to establish that the process disclosed by Weimer, which forms AlN particles via floating nitridation at ~1800K will necessarily form spherical particles. Specifically, Pratsinis

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states that for AlN powders formed by floating nitridation, "uniform spherical particles were found to be formed at temperatures of 1373 K. or greater, as opposed to a mixture of rod shaped and spherical particles at lower temperatures." Given that Weimer is made via the same process (floating nitridation) as that disclosed in Weimer, and forms AlN particles at a temperature of ~1800K (well above the 1373K temperature that forms spherical particles), the examiner maintains that the process of Weimer will necessarily result in the formation of spherical particles. The fact that Pratsinis explicitly states that forming AlN particles by floating nitridation at temperatures $\geq 1373\text{K}$ form "uniform spherical particles" is substantial proof of the inherency of the shape of the particles formed by Weimer. It is further noted that this proof comes solely from the prior art, not the applicant's specification. Last, the 102(b) rejection tendered by the examiner is **not** a prima facie case of obviousness, as the secondary reference was cited for merely evidentiary purposes, and the examiner in the 102(b) never purports altering the Weimer '121 reference in any way whatsoever. Thus, the rejection is a proper prima facie case of anticipation.

41. In addition to the arguments addressed above, the applicant has argued that the particles disclosed by Weimer form "light agglomerates," and thus cannot be spherical. The examiner respectfully disagrees. Webster's Dictionary 10th edition 1998 defines "agglomerate" as "gathered into a ball, mass, or cluster; clustered or growing together but not coherent." Thus, though Weimer '121 does teach the formation of "light agglomerates," this does not indicate that the shape of individual particles in the agglomerate is non-spherical. Further, the formation of "light agglomerates" does not

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indicate that the particles are physically bound or fused together. Rather, "light agglomerates" indicates that individual particles are clustered or collected together. A particularly illustrative and applicable analogy to the instant case is a bowl full of marbles. Each individual marble is a spherical and independent particle. However, when grouped together with other marbles, the resulting collection would be accurately described as an "agglomerate" of marbles. Thus, though Weimer '121 does teach in at least one example that the particles form "light agglomerates," the examiner's position (in light of the evidence provided by Pratsinis and the dictionary definition of "agglomerate") is that the "light agglomerate" taught by Weimer '121 would comprise a collection of individual spherical particles. Accordingly, this argument is unpersuasive.

42. All of the applicants remaining arguments are addressed by the reasoning set forth above. Thus, these arguments are unpersuasive.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhler whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

WJ4


Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700